PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Carlos Saldanha et al.	Examiner: Jin-Cheng Wang
Serial No.: 09/439,225	Group Art Unit: 2628
Filed: November 12, 1999	Docket: 1162.007US1

For: SYSTEM AND METHOD FOR DISPLAYING SELECTED GARMENTS ON A COMPUTER-SIMULATED MANNEQUIN

REPLY BRIEF UNDER 37 CFR § 41.41

Mail Stop Appeal Brief- Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Reply Brief is presented in support of the Notice of Appeal to the Board of Patent Appeals and Interferences, filed on December 7, 2006, from the Final Rejection of claims 1-45 of the above-identified application as set forth in the Final Office Action mailed on September 20, 2006 and is in response to the Examiner's Answer mailed on August 21, 2007. The Commissioner of Patents and Trademarks is hereby authorized to charge Deposit Account No. 19-0743 for any fees due in connection with the filing of this Reply Brief.

Before addressing the specific points raised in the Examiner's Answer, Appellants wish to briefly re-summarize the subject matter of the present application, certain aspects of which are recited by the pending claims. The specification describes a computer-simulated dressing environment in which a user is able to see what different selected garments look like when worn by a selected mannequin. In order to provide a realistic visual representation of the mannequin wearing the garment or garments, three-dimensional modeling software is employed to perform a draping and collision

simulation of the garment with the mannequin within a three-dimensional simulation scene. The individual mannequin and garment objects may be represented geometrically by combinations of geometric primitives such as planar polygons whose position in the three-dimensional space of the simulation scene is specified by assigning coordinates to the vertices of each polygon. The result of the draping and collision simulation produces what is referred to as a rendering frame from which a two-dimensional image that can actually be visualized may be produced by the process known as rendering.

As described previously in Appellant's Appeal Brief, a simulated dressing environment could be implemented by simply performing a draping and collision simulation in order to generate a rendering frame for each mannequin and each garment or garments that a user selects. The time involved in generating a rendering frame for a selected garment or garments and a selected mannequin, however, is too long for a satisfactory user experience given a practical amount of computing resources. This is especially true in a multi-user situation where a large number of users are accessing the simulated dressing environment simultaneously (e.g., by communicating with a web server over the internet). As a solution to this problem, the present application describes a simulated dressing environment in which two-dimensional images of different garments are rendered from rendering frames generated using a draping and collision simulation and then stored in a garment repository. A user may then select one or more of the two-dimensional garment images from the repository, and the pre-rendered two-dimensional garment images are then layered upon a two-dimensional image of a selected mannequin to form a two-dimensional image of the mannequin wearing the garment or garments. Shells defined around the mannequin that are designed to mimic the physical effects of other garments may be used during the draping and collision simulation to produce versions of two- dimensional garment images that may be combined with other two-dimensional garment images by the layering process. The simulated dressing environment is thus able to rapidly form images of a selected mannequin wearing one or more selected garments that are similar in appearance to what would be produced by performing a separate draping and collision simulation for each garment and mannequin that a user selects.

Various aspects of the simulated dressing environment as described above are recited by the pending claims as methods or systems that relate to the layering of two-dimensional garment images upon a two-dimensional garment image and/or that relate to the process for generating rendering frames from which the two-dimensional garment images suitable for such layering are produced. The pending claims 1-45 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakaguchi (U.S. Patent No. 6,310,627) in view of Volino et al. ("The Evolution of a 3D System for Simulating Deformable Clothes on Virtual Actors," MIRALab 1998) and Weaver (U.S. Patent No. 6,404,426). Insofar as is relevant to the present application, however, the teachings in those references only relate to the three-dimensional modeling of garments interacting with mannequins (e.g., a draping and collision simulation) and/or to the rendering of a two-dimensional image of a mannequin wearing a garment from a three-dimensional model. Appellants do not assert that there is anything new about performing a draping and collision simulation between a garment and a mannequin. Among the things that are asserted to be new and non-obvious, however, are the layering of two-dimensional images generated from draping and collision simulations to form a desired image of a mannequin wearing a selected garment and the manner in which such draping and collision simulations are performed in order to generate two-dimensional garment images suitable for such layering. Appellants can find no teaching or suggestion in any of the cited references that relates to forming two-dimensional images by layering two-dimensional garment images rendered from three-dimensional models (i.e., rendering frames) on top of a mannequin. Appellants believe that one of ordinary skill in the art, given the teachings of the cited references, would only be led to construct a simulated dressing environment similar to that described earlier in which a user selects a mannequin and one or more garments, a three-dimensional model of the mannequin and the garment(s) is constructed in which a draping and collision simulation is performed, and a two-dimensional image of the mannequin wearing the garment is rendered from the three-dimensional model. As stated above, such a simulated dressing environment is so computationally intensive that it cannot be used in many situations. The dressing environment described in the present application and various aspects thereof as recited by the pending claims

represent solutions to this problem. Appellants thus believe that the cited references actually teach away from what is presently claimed.

It does not appear to Appellants that the Examiner's Answer ever alleges that the cited references would lead one of ordinary skill in the art to construct a simulated dressing environment in which a two-dimensional image of a mannequin wearing a garment is formed by layering two-dimensional garment images rendered from three-dimensional rendering frames on top of a mannequin or to ways of generating such three-dimensional rendering frames from which two-dimensional garment images suitable for such layering may be rendered. Instead, the arguments in the Examiner's Answer seem to only mischaracterize the recitations of the claims in order to find those recitations in the cited references or in order to assert that the recitations do not make sense. Appellants address those arguments below.

1. Shells defined around the representative mannequin

In the case where multiple garments are selected for wearing by the mannequin, one garment may affect how another garment fits. This presents a problem when multiple two-dimensional garment images are layered on top of a mannequin. For example, a shirt worn by itself may billow out somewhat as compared to when the shirt is worn under a coat. In order to deal with this problem, each two-dimensional garment image in the repository may derived from a rendering frame generated by constraining portions of the garment to reside within or outside of one or more shells defined around the representative mannequin in the rendering frame during the draping and collision simulation, where each shell is a three-dimensional construct designed to mimic the physical interaction of the garment with another garment. The particular shell or shells used to generate a rendering frame for a garment define a particular version of that garment. A version of a shirt suitable for combining with a coat, for example, may be produced by constraining the shirt to reside within a defined shell that mimics the physical effects of a coat during the draping and collision simulation. The shell prevents the shirt from billowing out in the rendered two-dimensional image as it would if worn by itself. After a two-dimensional image of the shirt is rendered from the rendering frame and layered upon the mannequin, a two-dimensional image of the coat

may then be layered on top of the shirt without the shirt showing through. Similarly, a version of a coat suitable for combining with a shirt may be produced by constraining the coat to reside outside of a defined shell during generation of the rendering frame in order to simulate the effects of a shirt under the coat. The rendered two-dimensional image of the coat then appears somewhat bulkier than would be the case if the draping and collision simulation were performed without such a shell so that the two-dimensional coat image may be layered onto a two-dimensional shirt image without the latter showing through.

The function of the defined shells around the mannequin as described above is thus to enable the generation of rendering frames for garments from which two-dimensional garment images may be rendered that can be combined with two-dimensional images of other garments by layering of the two-dimensional images upon a two-dimensional image of a mannequin. In alleging that the claims reciting methods or systems involving such shells (e.g., claim 1) are obvious in view of the cited references, the Examiner's Answer does not argue that the teachings of those references would lead one or ordinary skill in the art to employ such shells as recited in the claims. Rather, the Examiner's Answer essentially tries to read the limitations involving the shells out of the claims by interpreting the word "shells" in an abstract manner that is contrary to the plain language of the claims and to the description of the shells in the specification to which the claims refer. In doing so, the Examiner's Answer discusses at great length the three-dimensional modeling of mannequins and garments described in Sakaguchi and Volino et. al. It seems to Appellants, however, that the Examiner's argument boils down to this: Since one could refer to the outer surface of a mannequin, to the surface of a garment, or to the layers of a multi-layer garment in a three-dimensional simulation as "shells," the limitations regarding the use of shells to generate rendering frames as recited in certain of the pending claims are at least suggested by the description in Volino et. al and/or Sakaguchi of the outer surface of a mannequin, the surface of a garment, or the layers of a multi-layer garment.

Appellants do not believe that the Examiner's reading of the claim language is permissible for at least the following reasons. Firstly, the claims reciting the use of defined shells around the mannequin in generating rendering frames also recite

elements that include a mannequin and a garment. The shells are thus recited as things apart from either a mannequin or a garment. Secondly, claims must be read in light of the specification. The shells referred to in certain of the pending claims are described as three-dimensional constructs employed during a draping and collision simulation that are neither a garment nor a mannequin. Thirdly, the recited limitation that the shells are designed to mimic the physical interaction of the garment with another garment is a positive functional limitation and not a mere statement of intended use. In the Examiner's Answer on page 36, it is stated that "Appellants' claimed shells are not necessarily surrogates for garments as the claim is broadly construed. The skin surfaces are also shells wherein the garments reside outside of the shells as required by claim1." Appellants believe that the Examiner's position on this point is clearly contrary to the law. A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. *In re Swinehart*, 439 F.2d 210, (CCPA 1971). A functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. MPEP 2173.05(g).

2. Layering the rendered garment image upon a two-dimensional image of a selected mannequin

The simulated dressing environment described in the specification and certain of the pending claims refer to the layering of a two-dimensional image of a garment upon a two-dimensional image of a selected mannequin, where the two-dimensional image of the garment is rendered from a rendering frame. As described above, this technique for forming images is an important reason for the computational efficiency of the simulated dressing environment. Appellants have asserted in the Appeal Brief that the cited references do not teach such a technique for forming an image of a mannequin wearing a garment. Rather, the cited references only teach forming an image of a mannequin wearing a garment by rendering a two-dimensional image from a three-dimensional simulation scene (which may be referred to as a rendering frame)

containing both the mannequin and the garment or garments. In attempting to read certain limitations of the pending claims involving the layering of two-dimensional images, the Examiner's Answer ignores the distinction between a two-dimensional image and a three-dimensional model. For example, the Examiner insists that the 2D garment panels described in Volino et. al or the garment patterns described in Sakaguchi are two-dimensional images that are stored as files in an object database, analogous to the repository recited in certain of the pending claims. The 2D garment panels described in Volino et. al and the patterns described in Sakaguch which are stored in an object database, however, are absolutely not two-dimensional images. They are three-dimensional objects and do not become part of a two-dimensional image until they are rendered as such from a three-dimensional model. To further explain this distinction, a three-dimensional garment panel object could be rendered into a very large number of two-dimensional images of the garment panel that depend upon the point of view from which the rendering takes place and the deformation state (i.e., how the garment is crumpled or otherwise deformed). The Examiner maintains that the 2D garment panels of Volino et. al are two-dimensional images in order to argue that they are layered upon a mannequin when a two-dimensional image is rendered from the three-dimensional model, thus meeting the claim limitation that recites the layering of a two-dimensional image of a garment upon a two-dimensional image of a selected mannequin. Even if the rendering of a two-dimensional image from a three-dimensional model containing a three-dimensional mannequin object and a three-dimensional garment image could, loosely speaking, be referred to as "layering," it is not the layering of a two-dimensional garment image upon a two-dimensional mannequin image because those two-dimensional images do not exist until the rendering process is completed.

3. Shape blending

In arguing that the Sakaguchi and/or Volino et. al references teach or suggest shape blending as recited in claim 16 and other claims, the Examiner's Answer on pages 38 and 41 puts forth a description of what shape blending is. The Examiner's Answer argues that shape blending as referred to in the specification and claims is the

combining of parameters from a first rendering frame with parameters of a second reference frame and further argues that, since the claims do not recite this, the language of claim 16 is either "unacceptable" or "does not make sense." This, however, is simply an incorrect interpretation of shape blending as the term is used in the present application. Starting on page 6, line 28 of the specification, it is stated that:

> Shape blending tcchniques are used to modify the mannequin and/or garment parameters to desired selected values by interpolating between the corresponding parameter values of reference rendering frames. In accordance with the invention, garment and/or mannequin parameter values corresponding to the desired changes are modified within a rendering frame, and a partial further simulation is performed that creates a new rendering frame containing the changed mannequin and/or garment. For example, the dimensions of the individual panels making up the garment may be changed, with the resulting panels being then blended together within the simulation environment. Similarly, the dimensions of a mannequin may be changed by blending the shapes of previously simulated mannequins. The parameters are thus keyframed within the simulation sequence, where keyframing, in this context, refers to assigning values to specific garment or mannequin parameters in a simulation scene and generating a new frame using a linear combination of parameter values (e.g., interpolation or extrapolation) generated from a previous simulation. In this way, a new rendering frame is generated that contains a mannequin with different measurements and/or a garment with a different dimensions as selected by the user. Thus, the simulation need only be fully performed once with a representative garment and mannequin, with keyframing of parameter values within the three-dimensional modeling system being used to generate rendering frames containing a particular mannequin and garment as selected by a user. Simulation of the modified garment interacting with the mannequin as the partial further simulation takes place requires much less computation than a complete resimulation of the draping and collision of a changed garment over a mannequin.

The Examiner's explanation of shape blending is thus not consistent with either the description given above or the language of claim 16. In order to more clearly explain what shape blending is in the present context, a more concrete example will be given. When one buys a pair of pants, it is common to select the pair of pants based upon only two parameters, the pants length or inseam and the waist size. Of course, these are not the only parameters that physically define the pants since pants also have, for example, a crotch length or rise, a hip dimension, and a leg circumference. These

parameters would normally vary with the inseam and waist size in some proportionate manner as defined by the pants manufacturer. Similarly, a particular pair of pants in a simulated dressing environment may be selected by the user according to inseam and waist size. The hip circumference and crotch length of the pants with that inseam and waist size would be fixed at some proportionate values. Suppose that a draping and collision simulation has been performed with those pair of pants to generate a first rendering frame from which a two-dimensional image of the pants may be rendered. Now, further suppose that it is desired to generate a second rendering frame containing a pair of pants with a different waist size and inseam. One way to do this would be to simply perform another draping and collision simulation with those pants. Appellants have found, however, that the three-dimensional modeling software used to perform the draping and collision simulation may be used to produce the second rendering frame by linearly combining parameters of the first rendering frame. Thus, in this example, the waist size and inseam are changed in the first rendering frame. The three-dimensional modeling software then linearly combines parameters of the first rendering frame during a partial draping and collision by, for example, scaling the hip circumference in accordance with the newly selected waist size and calculating the crotch length in accordance the newly selected inseam and the newly selected waist size (i.e., as a linear combination of those parameters). Appellants do not find any teaching in the cited references that relates to shape blending as the term is used in the pending claims.

4. Other remarks

On page 21 of the Examiner's Answer, it is stated that the term "pre-rendered" as used in the Appeal Brief is found nowhere in the pending claims. That is true, but all that Appellants mean by "pre-rendered" images is that they have been rendered before being layered to form a composite two-dimensional image or before being stored in a repository as recited by certain of the pending claims. The prefix "pre" is only used to emphasize the distinction discussed above between a two-dimensional image (i.e., an image that has been rendered) and a three-dimensional object. Related to this point, page 21 of the Examiner's Answer also states that "claim 1 recites "a three-dimensional rendering frame of the representative mannequin wearing the garment" rather than

'two-dimensional garment and mannequin images' argued by Appellants." On page 32, the Examiner's Answer also argues for reasons that Appellants do not understand that the recitations in claim 1 relating to a three-dimensional rendering frame of the representative mannequin and the two-dimensional image of a selected mannequin are contradictory. Appellants believe it has been made clear that what claim 1 is reciting is the generation of a three-dimensional rendering framc of the representative mannequin wearing the garment, the rendering of a two-dimensional garment image from that rendering frame, and the layering of the rendered two-dimensional garment image upon a two-dimensional image of a selected mannequin (not necessarily the same as the representative mannequin used in the generation of the rendering frame) in order to form a two-dimensional image of the selected mannequin wearing the garment.

Regarding the arguments of the Examiner's Answer with respect to thc claim recitations relating to selectable camera angles, compositing rules for layering two-dimensional images in a prescribcd order, and the use of Z-coordinates to layer two-dimensional images in a particular order, Appellants repeat that those claim recitations are in the context of layering two-dimensional images as rendered from three-dimensional rendering frames to form a composite image. None of the cited references teach or suggest anything similar to this technique for forming composite images. The cited references necessarily also do not teach or suggest in conjunction with the layering technique the use of selectable camera angles, compositing rules for layering two-dimensional images in a prcscribed order, or the use of Z-coordinates to layer two-dimensional images in a particular order.

Appellants believe that claims 1-45 were not properly rejected under § 103(a), and it is respectfully submitted that the claims are patentable over the cited art. Reversal of the rejections and allowance of the pending claims are respectfully requested.

Respectfully submitted,

CARLOS SALDANHA et al.

By their Representatives,

SCHWEGMAN, LUNDBERG & WOESSNER, P.A.
P.O. Box 2938
Minneapolis, MN 55402

Date October 22, 2007 By /J. Kevin Parker/
J. Kevin Parker
Reg. No. 33,024

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 22 day of October 2007.

John D. Gustav-Wrathall
Name

John D. Gustav-Wrathall
Signature